

What is claimed is:

1. A method for delivering a gene in a system for delivering DNA specifically to tumor tissues under anaerobic conditions, wherein a bacterium belonging to the genus *Bifidobacterium* is used as a gene delivery vector and then the DNA delivered specifically to tumor tissues under anaerobic conditions is expressed in said tumor tissues.

2. A method for delivering a gene in a system for delivering DNA specifically to tumor tissues under anaerobic conditions, wherein a bacterium belonging to the genus *Bifidobacterium* and having the DNA coding for a protein which has a higher activity than in its parent strain is used as a gene delivery vector and then the DNA delivered specifically to tumor tissues under anaerobic conditions is expressed in said tumor tissues.

3. A method for delivering a gene in a system for delivering DNA specifically to tumor tissues under anaerobic conditions, wherein a bacterium belonging to the genus *Bifidobacterium* transformed with a recombinant DNA having said DNA is used as a gene delivery vector and the DNA delivered specifically to tumor tissues under anaerobic conditions is expressed in the tumor tissues.

4. The method as claimed in any one of Claims 1 to 3, wherein the DNA is selected from the group consisting of:
(a) DNA coding for a protein having an antitumor activity, and
(b) DNA coding for a protein having an activity of converting

a precursor of an antitumor substance into the antitumor substance.

5. The method as claimed in Claim 4, wherein the protein having an antitumor activity is interleukin-2.

5 6. The method as claimed in Claim 4, wherein the precursor of an antitumor substance is selected from the group consisting of 5-fluorocytosine, 5-aziridino-2,4-dinitrobenzamide, ganciclovir, a glucuronic acid-conjugated antitumor substance and a lysine-conjugated antitumor substance.

10 7. The method as claimed in Claim 4, wherein the protein having the activity of converting a precursor of an antitumor substance into the antitumor substance is a protein selected from the group consisting of cytosine deaminase, nitroreductase, herpes simplex virus type 1 thymidine kinase and
15 β -glucuronidase.

8. The method as claimed in Claim 3, wherein the recombinant DNA is an expression vector.

9. The method as claimed in Claim 8, wherein the expression vector has a promoter and a terminator functioning in a bacterium
20 belonging to the genus *Bifidobacterium*.

10. The method as claimed in Claim 9, wherein the promoter and terminator are those involved in expressing a gene coding for histone-like DNA-binding protein (HU protein) derived from *Bifidobacterium longum*.

25 11. The method as claimed in Claim 9, wherein the promoter

and terminator are DNAs located at the 1- to 192-positions and at the 472- to 600-positions respectively in the nucleotide sequence set forth in SEQ ID NO: 1.

12. The method as claimed in any one of Claims 1 to 11,
5 wherein the bacterium is *Bifidobacterium longum*.

13. The method as claimed in any one of Claims 1 to 4 or 6 to 12, wherein the bacterium is *Bifidobacterium longum* 105-A/pBLES100-S-eCD (FERM BP-7274).

14. A method for expressing a gene coding for a protein
10 having an antitumor activity in tissue tumors specifically, which comprises use of the bacterium as claimed in any one of Claims 1 to 5 or 8 to 12.

15. A method for expressing a gene coding for a protein having the activity of converting a precursor of an antitumor
15 substance into the antitumor substance in tissue tumors specifically, which comprises use of the bacterium as claimed in any one of Claims 1 to 4 or 6 to 12.

16. A pharmaceutical composition comprising the bacterium as claimed in any one of Claims 1 to 13.

20 17. The pharmaceutical composition as claimed in Claim 16, wherein the pharmaceutical composition comprises a combination of the bacterium as claimed in any one of Claims 1 to 4 or 6 to 13 and the precursor of an antitumor substance.

25 18. The pharmaceutical composition as claimed in Claim 16, wherein the pharmaceutical composition comprises the

bacterium as claimed in any one of Claims 1 to 4 or 6 to 13 and the precursor of an antitumor substance.

19. The pharmaceutical composition as claimed in any one of Claims 16 to 18, wherein the bacterium is *Bifidobacterium*
5 *longum*.

20. The pharmaceutical composition as claimed in any one of Claims 16 to 19, wherein bacterium is *Bifidobacterium longum* 105-A/pBLES100-S-eCD (FERM BP-7274).

21. A bacterium belonging to the genus *Bifidobacterium*,
10 which is used in the method as claimed in any one of Claims 1 to 13.

22. *Bifidobacterium longum* 105-A/pBLES100-S-eCD (FERM BP-7274).

23. DNA having the nucleotide sequence set forth in SEQ
15 ID NO: 1.

24. A method of treating a solid tumor, which comprises use of the method as claimed in any one of Claims 1 to 15.

25. A method of treating a solid tumor, which comprises administering the bacterium as claimed in any one of Claims
20 1 to 4 or 6 to 13 in combination with the precursor of an antitumor substance.

26. An anaerobic bacterium belonging to the genus *Bifidobacterium* capable of expressing a gene coding for a protein having an antitumor activity in only cancer cells under
25 substantially anaerobic conditions.

27. An anaerobic bacterium belonging to the genus *Bifidobacterium* capable of expressing a gene coding for a protein having the activity of converting a precursor of an antitumor substance with low toxicity to humans and animals
5 into an antitumor substance in only cancer cells under substantially anaerobic conditions.